Project Proposal

Persuasive Games: Can persuasive design be used to raise funds for charity?

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1. Project Background

**1.1 Abstract**

*“To give away money is an easy matter and in any man's power. But to decide to whom to give it and how large and when, and for what purpose and how, is neither in every man's power nor an easy matter.” – Aristotle*

Persuasive games are videogames designed with the intention of persuading users to change their behaviour (Bogost, 2007). This project will focus on implementing these new design theories, and test their effectiveness. To do this the game created will intend to persuade players to donate money to charity. The charity in question will be an environmental based charity. Given their important work you would not assume they were overlooked when people were donating, but that is not the case, so they have much to gain from this work.

**1.2 Introduction**

Environmental issues are possibly the biggest issue in the history of mankind. Organisations such as the World Wildlife Fund are often the first response and will be the target of the projects help. These problems are easily ignored as their distant effects have no impact on everyday lives, and there are seemingly more pressing issues to be dealt with (Giddens, 2008). Unfortunately, by the time they are effecting lives it is believed it will be too late to combat effectively.

Pollution is causing alarming levels of toxicity, leading to health problems world-wide. Problems harder to treat as natural-resources for medicine are wiped out from ever-decreasing biodiversity and human expansion destroying ecosystems. Other essential natural-resources are in continuous decline creating shortages in the power and agricultural industries. Particularly problematic as overpopulation is already causing it to reach unsustainable levels. Meanwhile global warming will displace millions of people due to rising sea levels, and destructive weather will cause untold destruction.

As charities attempt to prevent or at very least reduce the impact of these global threats they require ever increasing funds. Despite their important work, they receive far less of our donations than other forms of charities (Giving USA, 2015). Increasing this is obviously important work, and the primary motivation behind this work.

Persuasive technology is a relatively new field, but has already proven to be highly effective (Steinemann, et al., 2015). Videogames can be particularly persuasive due to their immersive nature. Additionally their wide appeal and accessibility could potentially lead to a larger user base than other forms of software, and therefore increase the likelihood of donations. As such this project will focus on creating a videogame designed specifically to persuade players to donate money to environmental charities.

Of course the artefact can have other uses as well. Education is often seen as one of the obstacles facing conservationists, as people tend to only support causes they are educated on. Videogames also happen to be highly effective ways of educating people (Virvou, 2005). They provide engrossing simulations that allow users to learn from seeing the effects of actions in person. The artefact will attempt to educate users as it will potentially increase its persuasiveness.

There is a potential for the creation of videogames that have obvious positive impacts on both individuals and society, and pave the way for more games with positive intentions. As for the impacts the artefact would have on individuals, it has been proven that giving to charity increases an individual’s happiness. This is a very good thing for charities, as it has also been proven that the happier a person is the more likely they are to donate.

To create the artefact a game engine will be used, specifically Unity. It will be developed for mobile platforms which offer key advantages for the artefact design, such as accessibility. Unfortunately, due to the nature of the design the project will not be developed using an agile development methodology, instead it will use the waterfall method.

After the artefact has been created the general user experience will be evaluated. Questionnaires and interviews will be used as they are easy to produce and implement, and together eliminate many of each other’s negatives (bias, depth). This data will then be analysed to produce suggestions for a revised design with greater persuasiveness.

**1.3 Tools**

The game will be developed using Unity game engine (Unity Technologies, 2005). Unity is a flexible game engine capable of producing any form of game. It is also free and has mobile development capabilities. Unity is easy to learn and use, due to its documentation and the plethora of tutorials available for it. It also allows for rapid prototyping, and has excellent 2D-specific features. Though it has a complicated and often confusing GUI (graphic user interface), and is often less impressive graphically compared to the competition

Other options for developing the game included programming without the use of any software, and Game Maker: Studio (YoYo Games, 1999). Developing without the use of software is free and perhaps the most flexible option, however it greatly increases development time so was discounted. Game Maker: Studio is a very simple way to develop games, offering many “drag-and-drop” options. Though any scripting will require learning its own programming language that cannot be used elsewhere. To publish to mobile platforms requires the paid version however, so it was also discounted.

Graphical assets will be made using GIMP (The GIMP Development Team, 1996), a free software of a professional standard. It also has a wide variety of mods available, making it very flexible. Another option that could have been chosen is Adobe Photoshop, which is very similar to GIMP. It is not free though, so GIMP was picked instead.

Audio will be created using Logic X (Apple Inc., 2002), which is quite easy to use and offers the features of a full, professional studio in a relatively cheap computer program. It is often viewed as the best music software by industry professionals, and despite not being free it is available to use for the project. If it had not been available, Q-Base is a free music creation software that allows the use of certain equipment and plug-ins not usually supported in free software.

**1.4 Development Methodologies**

The project will use the waterfall development methodology (SDLC – Waterfall Model) due to the time constraints. The waterfall method means once a stage of development has been completed it cannot be returned to, so there will only be one iteration of the game. The only benefit to this is the time gained from testing, evaluating and redesigning during development. Unfortunately the extra feedback from player testing would be invaluable to the project, as it could be made far more persuasive with it. An agile based development plan would allow this (Abrahamsson, 2002) but it cannot be done for two reasons: not enough time to complete extra testing and designing, and not being able to test until the project is almost complete. This is because the project will not be enough of a game to test until week 13/14. Of course this does have its benefits, the major one being no “feature creep” (no additional features added during development that increase development time). If given more time this plan would be followed by numerous, shorter cycles to change the game design based on feedback.

**1.5 Test Methodologies**

To test the effectiveness of the game volunteers will be asked to play the game over several days. This time will allow the players to progress through the game and experience most if not all of its features. They will be asked to complete a short questionnaire before and after playing the game, to gain empirical data on the player experience. They will also be given a short interview to collect more detailed feedback on the game and its persuasive nature.

The game will potentially increase the likelihood of the testers donating money to environmental charities, and maybe educate them on environmental conservation and the work environmental charities do. This is the effect that will hopefully be seen when the data analysis is complete.

Questionnaires are an easy way to collect data and keep testers completely anonymous. They allow consistent delivery of the questions, and also make the data easy to analyse as it is usually in the form of numbers. This reduces bias in the testing. On the other hand, they do not allow for testers to elaborate on their answers. To combat this an interview can be used to gain this more detailed feedback, though this does lose the anonymity and lack of bias of the questionnaires.

2. Aims and Objectives

**2.1 Aims**

The main aim of the project is to produce a videogame intended to persuade players to donate to conservation charities using the design principles suggested for persuasive games. The artefact will also use educational game and mobile game design theories in an attempt to enhance the persuasiveness of the artefact. Finally, the effectiveness of these will be tested in a user study to evaluate the player experience and gather their opinions on the persuasiveness of the game.

**2.2 Objectives**

1. Create a design using persuasive game theories. Review relevant literature on motivational psychology and how it can be used to create persuasive games. Use this information to design the artefact, specifically by implementing several persuasive game design theories.
   1. Add in educational elements. After the review of literature on educational games, add any design theories that would potentially enhance the persuasiveness of the game.
   2. Research successful mobile games and identify common design features. Implement these in the design to increase the appeal of the game.
2. Create the artefact. Develop the simulation, before adding in the game features.
   1. Simulation. The game will be based around a simplified simulation of a conservation park. The simulation will mostly be animal behaviour, such as movement and feeding habits. Other aspects such as poaching and weather will be implemented later as gameplay events.
   2. Player interaction. Players will take management of the in-game conservation park, so their interaction will be mainly be buying goods. This will be done through series of menus. The only additional interaction is the ability to look around the park and watch the simulated animals.
   3. Feedback. A very important aspect of the game to keep players informed and engaged. At a basic level notifications will inform players on changes in the simulation, in case they miss the limited feedback in the visual simulation. The overall progress of players in the game will be shown by a score system both on-screen and in more detail in a menu.
3. User testing. Have play testers complete pre-questionnaires and post-questionnaires. Also conduct interviews after play testing has finished.
4. Analysis and interpretation. Review the data acquired from the questionnaires and interviews. Determine whether the game has the persuasive effect desired. Produce suggestions to enhance the design and make it more persuasive.

3. Literature Review

**3.1 Biology Conservation**

The importance of conservation cannot be exaggerated. For example, with an ever growing world population, more food must be produced with less land. Conservation agriculture is the only way to fulfil this demand, using our natural resources in a more efficient and sustainable way (Hobbs, et al., 2008). Nutrition plays an obvious and large role in public health as well, particularly pollinator related foods (Smith, et al., 2015). Though perhaps an even greater risk to global health is the loss of potential source of medicines. At the beginning of the 21st century approximately 25% of all drugs prescribed originated from plants (Rates, 2001).

Both of these have significant economic impact. However they are only two of many severe risks to the global economy. Mark Carney (Governor of the Bank of England, Chairman of the G20’s Financial Stability Board) recently called climate change “the Tragedy of the Horizon”. Damage, disruption and the displacement of populations add up to perhaps the greatest risk to financial stability we have ever seen. Conservation not only helps to mitigate these risks, but can even have a positive economic impact in the form of ecotourism.

Biodiversity is an important aspect of conservation. In an ecosystem every species has an important role, increasing its productivity and sustainability (Gamfeldt, et al., 2008). Yet with almost 23,000 species in danger of extinction (IUCN, 2015), biodiversity levels are decreasing. In order to combat this many institutions are working to prevent these species from becoming extinct, offering protection and setting up breeding programs. It is this aspect of conservation that the artefact will be based on.

For these reasons and many more biology conservation has become a global worry. In fact, climate change is now seen as the top global threat (Carle, 2015). Despite this, animal and environmental charities receive much less financial support than their counterparts, e.g. roughly 3% of donations in the USA (Giving USA, 2015). The artefact will attempt to show how the use of persuasive technologies can increase this. As the majority of donations come from individuals, this will be the target market of the artefact.

Education has long been a cornerstone of conservation biology. It is not simply to develop the next generation of conservationists, but to encourage support from the public in these matters. Unfortunately, an increasing disparity between the knowledge of professionals and the public has been observed (Brewer, 2006). Therefore, the artefact will also attempt to educate users about the environment and what conservation groups are doing to protect it.

**3.2 Persuasive Games**

The use of technology to change user behaviour is a relatively new field, but has already proven to be highly effective (Steinemann, et al., 2015). Video games in particular have great potential for this. They provide psychological need satisfaction to motivate players in game (Rigby, et al., 2010), which can be turned towards motivating certain behaviours out of games. This is often connected to the immersion level of the game, something which video games are naturally high in. As such, the artefact will be a video game.

The use of technology to change human behaviour does raise ethical and moral issues (Verbeek, 2006). Is the ability of designers or even technology to influence human behaviour a threat to human freedom? Who is responsible for the impact of the technology? All of these questions must be addressed during the project.

The game will be designed using the principles put forward by Oinas-Kukkonen and Harjumaa (2008). Their work is based on that of Fogg (2002), the first theorization of persuasive technologies, with the intention of improving upon his ideas. Of the 28 principles set forward in their work, the game design will focus on the following:

1. Simulation/Reduction. The game will be a simplified simulation of a nature reserve. This will allow players to see the impact of both their actions and the actions of other (e.g. poachers). By simplifying the simulation, it will reduce the time between seeing the cause and effect for players. This in turn will increase the persuasive impact of such events. Plus, it will allow anyone to play the game as no prior knowledge is required in order to manage the simulation.
2. Personalization. Players will be able to make key choices and personalise many aspects of the game. This will promote attachment to those aspects of the game. Players more attached to aspects of the game will feel a greater impact when those aspects are effected within the game. As such, those events will have a greater persuasive effect on players.
3. Self-monitoring. Being able to track their progress will increase the feedback players receive about their actions in game. It will also encourage players to continue playing or return to the game to continue with that progress.
4. Praise/Rewards. To accompany the self-monitoring mentioned above, players will receive other forms of feedback in game. This will encourage the target behaviour.
5. Real-world feel. The game will simulate a real world situation and provide information on the people and organisations involved, giving it more credibility among players, and making them more open to persuasion.
6. Expertise. Every action in game will be accompanied by small pieces of information. This will not only validate player actions (encouraging the target behaviour) but also validate the system (giving it more credibility). This mixture will increase the overall persuasiveness of the game.

Opwis et al. (2015) created a persuasive game intended to persuade players to donate to charity. Their results were positive, and findings that the game was more effective the more interactive it is will be useful. However, the study had many faults that should be addressed in this one. Testers are more likely to donate when the money is an unexpected bonus and it is not a spontaneous decision (they were approached on the matter). Though it does measure actual behaviour unlike questionnaires and interviews.

Another study conducted by Stanley et al. (2010) had a slightly different goal to persuade players to exercise more. It also had positive results, including the game being able to change player’s behaviour. Even though the sample size was very small, the feedback they received from the interviews was high. As such, they still managed to draw many useful conclusions with the data collected.

**3.3 Educational Games**

Multimedia learning has proven to be an exceptionally effective way of teaching. Presenting learners with both text and images, so long as they are coordinated correctly, improves their comprehension (Mayer, 1997). Video games offer this and more. As well as pictures they provide interactive simulations, while keeping users engaged and motivated. As such studies have shown very positive effects on teaching (Virvou, 2005).

The design of the game will apply various theories on the design of educational games (Alan, 2007). Educating users may increase the persuasive nature of the game. Though even if it does not have the desired effect, it still provides a valuable service by educating users about the issues of conservation. The educational design principles used in the game are:

* Presenting a relevant, explorative and engaging environment.
* Authentic and complex challenges that create tacit knowledge with the support of explicit knowledge.
* Events that show multiple ideologies and promote reflection.
* Narrative elements that allow players to interpret their own understanding and significance.

However, to keep players engaged with the learning environment the game design must take notes from general game design practices. As proposed by Kiili (2005), flow, feedback and balance should all be considered to keep players engaged and learning.

**3.4 Simulation Games**

Simulation games are a common genre used as educational tools because they have proven to be effective (Sitzmann, 2011). A simulation is obviously a valuable learning tool, allowing users to see the effects of actions immediately as the speed of the simulation can be increased. On their own, simulations are difficult to engage with as they do not generate interest in the subject themselves. Simulation games do manage this with game design principles.

City building simulation games such as SimCity and Cities: Skylines capture player interest with gameplay. They have very high levels of interactivity and player choice that lead to a personal game world, which then leads to personal attachment. They also give very high levels of feedback. Changing road layout will show an immediate response with the traffic behaving differently in game. That will also have an effect on one of the many statistics available at all times via a menu system, a much more in depth form of feedback. These statistics have another way of keeping players engaged, as balancing the various aspects of the game keeps them in flow.

Some simulation games offer other ways of engaging players, like emotional attachments to animals in zoo management games. Others allow players to have experiences they could not have in real-life but would want to, such as flight simulators, and rely on their realism.

**3.5 Mobile Games**

The popularity of mobile games has soared in recent years, driven by the convenience and user-friendly nature of smart-phones. Developers can take advantage of the large market and lowered development costs in return for a few limitations. The control system must be designed around the unique interface of touchscreen phones, otherwise it will put off players immediately. The game should be playable in short bursts e.g. on the train or during a lunch break. The user base tends to be less experienced gamers, so the difficulty will have to be accessible yet still engage players as they grow in confidence.

Management-based simulation games are easily designed/adapted for a mobile development as the control scheme only requires interaction with a menu system. They can also be well suited to playing in short bursts, as the simulation may need long periods of player inactivity. The evolution of mobile games has led to a recent and controversial design idea, micro-transactions. Many players are annoyed by content being locked behind a paywall, but their use does allow the developer to make the game free as it provides an alternative source of income. Plague Inc. is an example of all of these features. It has a very simple interface involving a map and several menus, and the game is played in medium-length sessions that can be left and returned to with no impact to the experience. The developers made the game free to play, with the option for unlocking unnecessary features for a small fee. These all added to the management-game’s success.

**3.6 Conclusion**

The importance of the project has been proven with research into environmental conservation and the charities that carry out the work. In order for it to be successful though, it will have to use the design principles found when researching persuasive, educational and mobile games. Persuasive should increase the persuasiveness of the game, educational because it is believed that being educated on conservation will mean you are more likely to donate, and finally mobile to increase player engagement and retention. At the end it should be analysed like the case studies above to determine if it had been successful.

4. Design

**4.1 Game Design**

The artefact will be a 2D video game for mobile platforms. Players will need to manage a nature reserve that will be simulated in game. To be successful the players must improve the nature reserve over time, while battling many of the issues real-world reserves must deal with on a daily basis. While playing they should grow to understand the need for environmental conservation, maybe even develop an emotional attachment to the animals, and want to help the charities by donating as they have realised how low-funded they are.

Mobile games offer the largest market available, though it is often difficult to be noticed as the market is often over-saturated (Dreunen, 2015). In this case however the game should combat this due to its charitable intentions and well-known cause. The art style will be 2D as it severely reduces development time for two reasons; assets are much quicker to produce and collisions are far easier to develop. While this may reduce the real-world feel of the game, it can still be aesthetically pleasing.

It will simulate a simplified version of a nature reserve. The nature reserve will be based in South Africa, which are perhaps the most well-known nature reserves in the world. It may seem logical to base the game in a local ecosystem, but there are several reasons not to. The target audience (those in north-western cultures) spend far less time outdoors (Mitten, 2008) so are likely less knowledgeable on their local ecosystem. More as importantly, populations are often wary on the release of potentially dangerous animals local to them, if not completely opposed. As such they are far more likely to donate if the animals they are saving are far away (Kanagavel, et al., 2014). They also offer a wide variety of wildlife that includes many extremely well-known and popular animals such as “the big five”. Despite the importance of flora in an ecosystem the game will focus elsewhere, as most people do not relate as well to plants as animals. It will also keep the complexity of the game down to an accessible level.

Animal movement and feeding/drinking will be the most basic aspects of the simulation. The game will be 2D to allow movement and its animation to be implemented quickly. In turn this will free up resources to focus development on other features for the game. Animals will stay in packs, and some species will move around the reserve. At certain intervals they will feed and drink, moving if necessary. Herbivores will eat the various plants in the reserve and carnivores will eat other animals. Animals will also reproduce if there are more than two of them.

The simulation will include many aspects that have a negative effect on the reserve. The player will be tasked to manage the reserve and prevent or negate the impact of these negative events. The most prominent of these will be funding shortages, as this is the aspect of conservation that the player is being asked to combat by donating. The economy feature of the game will create funding shortages by players needing to pay for various things necessary to the running of the reserve:

* Construction of buildings or landscaping. This will be necessary for multiple aspects of the game. At the most basic level the player will need to ensure there is plenty of food and water for the animals, build fences for security and buildings for staff. Repairs will also cost money.
* Wages and utility bills. These will increase as the reserve improves, keeping progress at a steady pace. This will increase the amount of time players spend in the game and also keep it challenging. Players will not need to actively do this, it will simply come out of their funds at regular intervals.
* Buying animals from other reserves and zoos. Prices vary according to species.
* Funding rescue operations for animals in captivity. Chance to receive random animal.
* Research. This will offer a wide variety of choices, and will offer improvements and money-saving advancements.

To combat this the players will be able to earn money via:

* Donations. As the reserve improves the donations the player receives will increase. This should also show the player how reliant charities are on donations and what their own money would go towards if they donated.
* Milestones. When the player reaches certain milestones within the game they will receive “grants” to reward them.
* Selling animals to other reserves and zoos.
* Ecotourism. Despite a heavy initial cost this will grow to become the player’s main income if pursued.

Another issue the players will have to deal with is poaching. There will be a random chance of an animal falling prey to poachers, causing a reversal of progress. In order to maximise the emotional impact of poaching, players will be able to name their animals (or animals will arrive named). Certain animals are more at risk of poaching than others. In order to combat poaching the player must construct fences and hire guards. As well as the economic benefit, ecotourism will also combat poaching. The player can research various options to improve these options or discover new options.

Disease will also be a problem in the reserve. There will be a random chance of an animal coming down with a random disease. If not treated this increases the chance of other animals (especially those of the same species and carnivores) of catching the disease. To have a veterinarian treat the disease will cost the player a set amount per animal infected. The player can prevent diseases by researching vaccines for a high price, but will save them money in the long run.

Vandalism will be a random event forcing the player to make repairs. It will not be the only destructive force however, as weather events such as storms and bush-fires will also cause damage, and even harm the animals.

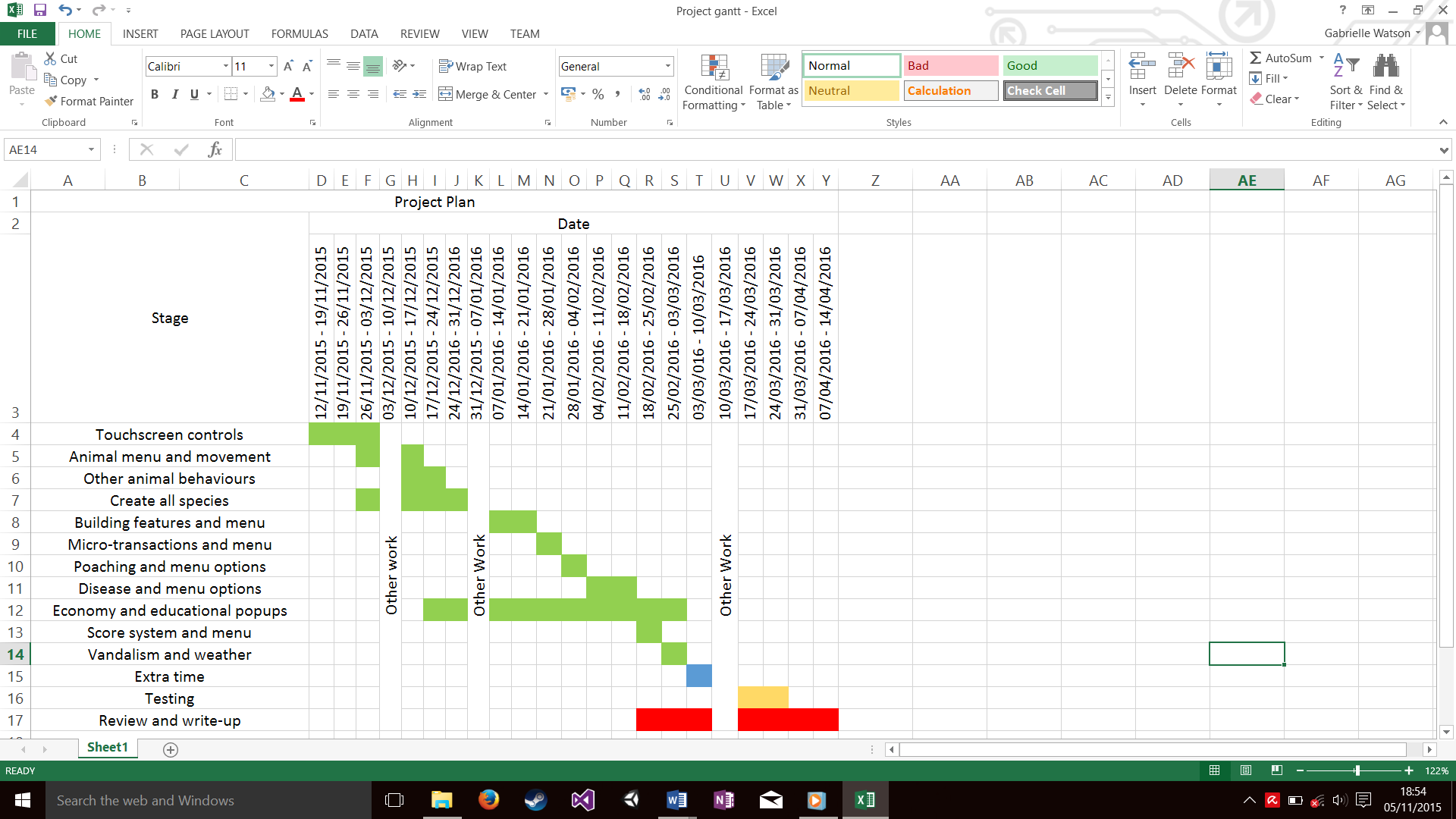
To inform the player of their progress they will be rated on various matters; conservation, renown and health. The conservation score will be determined by the rarity of the species in the reserve, and the amount and rarity of species bred. The renown score will be determined by the amenities and attractions available for tourists, and the popularity of the species in the reserve. Finally, the health score is determined by the health of the animals in the reserve, and the variety of species in the reserve.

To access the individual scores the player must enter a menu, however an average score of the three will be displayed on the game overlay. The overlay will also show notifications to inform the player of events in the world. Another menu will contain the micro-transactions for players to buy in game content for real money. This is a relatively simple way for players to donate and receive something in return almost immediately. The micro-transactions themselves will be for content that is relevant to the game, without leaving players who do not donate feeling negative about the game. The more people who play the game, and the longer they play, the greater the amount of donations received.

One of the most important aspects of the game will be the animals involved. They will all be well-known species, to not alienate players with little knowledge on South African ecosystems. Rarer versions of those species already featured in the game will be available as micro-transactions (e.g. white lions). If development does not go as planned the number of species can be reduced to gain time, as well as not implementing the weather and vandalism features. On the other hand, if there is more time then more species may be added, and more random events may be designed and developed.

**4.2 Gantt Chart**

The project has been planned with the use of a Gantt chart. Use of a Gantt chart increases project organisation, mainly due to the need to identify tasks before the start of the project and establish timeframes to complete them. This information is all displayed in a clear manner to help users understand the stages of the project. On the other hand, the information displayed is simple, not showing the resources used in each stage. Plus the chart is developed at the beginning of the project, and as it progresses and the plan changes the chart will no longer represent the development plan. It will either have to be updated or become irrelevant.



Stages:

1. Touchscreen controls
   1. Learn new mobile development skills.
   2. Create a basic application where the game area can be navigated using swipes, and a menu can be opened and closed using taps.
   3. Develop a script for notifications to be shown on screen, and then disappear after a short period.
2. Animal menu and movement
   1. Add a button to the menu that when pressed will add an animal object to the game area. A notification should popup when this happens.
   2. Create the movement AI so animals will move around the game area. This movement should be set by each species, so different species will move different amounts like in real-life.
   3. Animal-environment collision detection. A quite simple collision detection that will not allow animals to move outside the game area.
   4. **Optional:** Animals of the same species will gravitate towards each other.
   5. **Optional:** Animal-animal collision detection so they will not walk through each other.
3. Other animal behaviours
   1. Animals will feed and drink and certain intervals. These intervals should be set by species so different species eat at different rates like in real life.
   2. Carnivores will eat a random herbivore the player has in the game area. If one member of a species eats then the rest of the species will class as they have eaten. A notification should popup when this happens.
   3. **Optional:** Animals move to the necessary spot to perform these tasks.
4. Create all species
   1. Using the scripts created previously, create as many species as possible. There should be significantly more herbivores than carnivores.
   2. Certain species will need a high enough score before they become available.
   3. Assets will be created in this stage. All assets will be low quality so this step will not be time consuming.
5. Building features and menu
   1. Add another menu for building options.
   2. Add in building options on menu. When pressed the buildings will be added to the game area in set locations.
   3. Set each building’s effect.
6. Micro-transactions and menu
   1. Add another menu for micro-transactions.
   2. Add buttons for micro-transactions. They will just be rare species so the species will already have been made.
7. Poaching and menu options
   1. Create random event system.
   2. If poaching event occurs a random animal will be killed. Some species are more likely to be poached than others. A notification will popup when this happens.
   3. Add in anti-poaching options to existing menus.
8. Disease and menu options
   1. Add disease events to event system. A notification will popup when this happens.
   2. Add anti-disease options to existing menus.
9. Economy and educational popups
   1. Player receives money at set intervals. Money increases as the park score improves.
   2. Player receives money upon reaching certain goals.
   3. Options will now take money out of player’s funds.
   4. Implement similar system for micro-transactions, but player does not receive any more funds.
10. Score system and menu
    1. Add menu to show current scores.
    2. Add system to calculate scores.
    3. Average score shown on main game screen.
    4. A notification will popup when a score improves or decreases.
11. Vandalism and weather
    1. Add vandalism events to event system. A notification will popup when this happens. The chance of this will be reduced as the renown score increases.
    2. Add weather events to the event system. A notification will popup when this happens.
12. Extra time
13. Testing
    1. Testers must complete initial questionnaire.
    2. Play testing.
    3. Testers have post-questionnaire and interview.
14. Review and write-up
    1. Analyse results.
    2. Dissertation write up.

5. Project Risks

**5.1 Risk Matrix**

|  |  |  |  |
| --- | --- | --- | --- |
| Risk | Chance | Impact | Mitigation |
| Low experience with mobile development will increase development time. | High | Medium | Allow extra development time at first. Reduce development time by using game engine that exports to mobile platforms. |
| Other work must be completed during the project. | High | Medium | Allow for weeks where there is a low chance of work on the project in the plan. |
| Features take longer to develop than planned. | High | Medium | Expect features to take longer than initially thought, and make sure there is extra potential development time at end of project. |
| Game is developed faster than expected. | Medium | Low | Design extra features to be implemented in case of extra time. If there is quite a lot of extra time, consider testing early and adding another cycle onto development. |
| Development time needed for programming wasted on creating assets. | High | Medium | Have assets created by volunteers when available. |
| Not enough volunteers for testing. | Low | High | Offer services in return if necessary. |
| Unexpected events reduce development time e.g. illness | Low | Medium | Allow for potential extra development time at end of project. |
| Thesis takes longer to write than expected | Medium | Medium | Write majority of thesis before user testing results are back. |
| Lose work due to malfunction. | Low | High | Keep backups of all work online using GitHub, which also keeps previous iterations. |

6. Conclusion

**6.1 Potential Outcomes**

The project will lead to the creation of a persuasive videogame on environmental conservation. This game will potentially be able to persuade players to donate money to charities that do this work. It should also be able to educate users on the subject by being an interactive simulation, and keep them engaged using mobile game design principles. The testing will then be used to gauge the game’s current ability to meet these aims. Whether the data shows positive signs or not, the interview data will be used to develop suggestions on how to revise the design to create the desired effects.

7. Appendix

**7.1 Bibliography**

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